# Research Newsletter

**Responsive - Accessible - Relevant**

## A MESSAGE FROM THE RESEARCH DIRECTOR

*By: Cameron Kergaye, PhD, PMP, PE*

It's been an exciting year at UDOT's Research Division. In April we held the UTRAC research workshop for prioritizing problem statements, which resulted in 15 funded research projects. In July we hosted the AASHTO Research Advisory Committee meeting, a gathering of federal and state research managers and national transportation research advocates. In November we initiated a research poster session at UDOT's Annual Conference with 25 presentations by state, academic and research consultants. And throughout the year we conducted product evaluations, facilitated training events, published and distributed research reports, implemented new findings, and hired new experts to our team: a project manager and technical writer.

Looking forward to 2012, I'm hoping to build upon our successes and the many improvements we've made below the surface. In January a number of UDOT engineers will participate in the TRB Annual Meeting which represents the largest gathering of transportation research professionals and academics in the US. These engineers will be responsible for implementing new innovations in transportation presented at the meeting, such as those from the Strategic Highway Research Program (SHRP II). The Research Division tracks the status of TRB implementation and reports a benefit ratio (currently over 450 to 1).

Our doors are open to new ideas and suggestions. Our website has been redesigned for efficient content acquisition and communication. I encourage you to visit us online and help us make 2012 another stellar year.

Avalanche Prevention Testing

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**Completed and Active Research Available at: www.udot.utah.gov/go/research**

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**By: Patricia Cramer, PhD**
*Utah State University*
**David Stevens, P.E.**
*UDOT Research Division*

# WILDLIFE USE UTAH'S WILDLIFE CROSSINGS

Thousands of wildlife-vehicle collisions (WVCs) occur in Utah each year. Not only do these collisions pose safety hazards for motorists, but they threaten wildlife populations by bisecting wildlife habitat, making it difficult for wildlife to survive.

The Utah Department of Transportation (UDOT) along with the Utah Division of Wildlife Resources (UDWR) has been building wildlife crossings along with wildlife fencing (up to 8 feet high) since 1975 to help wildlife move under and over roads, thus preventing WVCs. In 2007 UDOT initiated a research project with Utah State University (USU) to evaluate how well different wildlife crossing structures in Utah work for passing mule deer, elk, and moose.


Figure 1: Bull elk use new arch wildlife crossings, I-70.

Using 35 remote motion-triggered cameras, wildlife were photographed by USU as they approached and used or repelled from culverts and bridges. In three years of monitoring, the cameras recorded over 15,000 mule deer passes through 14 existing wildlife crossings, and several thousand passes under bridges and culverts built for other reasons. All bridge designs had 89% or better success rates, meaning 11 to 5% of the mule deer approaching the structure repelled away, while the rest went through. Culverts had between 75 and 95% success rates. Culverts that were over 120 feet long had the lowest success rates, which implied that passages made for mule deer should be less than 120 feet long for best success rates.


Figure 2: Mule deer use overpass over I-15.

The photographic evidence supports the statement that UDOT wildlife crossings are working for mule deer. Crossing designs that minimize lengths under the road, and maximize the width or span of the structure are the most successful in passing mule deer. Future research will help determine if any designs work in passing skittish elk in Utah, and if placing wildlife fencing at existing box culverts and bridges can motivate mule deer and elk to use these structures. The final research report to UDOT will be published soon. This study continues with funding from UDWR and conservation organizations. Click here to view wildlife videos from this study on YouTube.

For more information contact Dr. Patricia Cramer of USU at patricia.cramer@usu.edu, or the following UDOT partners: Brandon Weston (brandonweston@utah.gov), Paul West (paulwest@utah.gov), and David Stevens (davidstevens@utah.gov).

By: Abdul Wakil, P.E.
UDOT Research Division

# RESEARCH POSTER SESSION 2011

At this year's UDOT Annual Conference and for the first time, the UDOT Research Division featured a "Research Poster Session". This session was held on November 16, 2011 from 8:00 am to 12:00 pm, outside the main hall of the South Towne Exposition Center in Sandy.

Figure 1: 2011 UDOT Research Poster Session

University professors, students, consultants and UDOT personnel presented twenty-five posters on transportation challenges and solutions in an informal setting. Innovations and improvements to current practices were discussed in a one-on-one setting, and presenters stood beside their posters during the presentation to explain and/or answer questions about the research.

The Transportation Research Poster Session was a valuable opportunity to share research, meet creative minds, and discover new approaches to transportation practices. The poster session was well received, brought researchers and others together and was a positive step towards achieving the interactions needed to ensure a robust system for transportation research in Utah.

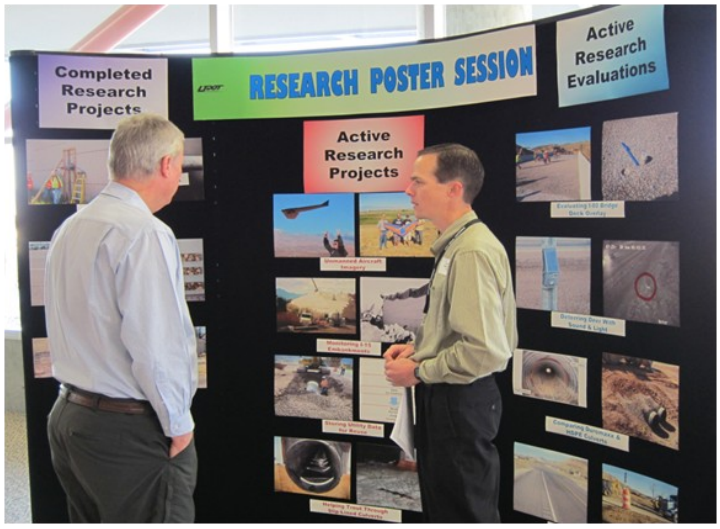


Figure 2: Project Manager, David Stevens, (right), Representing UDOT Research Division.

On behalf of the UDOT Research Division, we extend our thanks to all who participated in the 2011 Research Poster Session. We would like to thank all the individuals who gave us suggestions of how to improve the overall Research Poster Session experience and we will implement many of the feasible ideas into the next year.

It is our hope that the Research Poster Session serves to illustrate the magnitude and diversity of research being carried out at our institutions and we look forward to hosting it again in the future.

For more information contact Abdul Wakil of the UDOT Research Division at awakil@utah.gov.

**By: Ernest J. Nielsen**
*Brigham Young University*
**Daniel Hsiao, P.E.**
*UDOT Research Division*

# PROJECT SCHEDULING RESEARCH

UDOT leadership was interested in understanding the impact of current practices and potentially improved behaviors in project scheduling. A research project was initiated to search for insight on the next steps of maturity in an industry that relies on project management as an organizational behavior.

Typically, an organization progresses through levels of maturity related to business processes, such as project management. These levels range from Ad hoc (each participant does it "their way") to Mandatory process behavior (all action and documentation of a business function must be done in the same way, audited and reviewed).

The purpose of the Project Scheduling Research Project was to determine the level of current performance in the maturity cycle of project scheduling, and recommend an appropriate ongoing level of performance, focusing on the nine areas of project management organizational behavior, identified in Illustration 1.

The objective statement for the project, drafted by the research project team, was to "analyze the current project scheduling practices in UDOT and recommend proven practices that can: (1) Improve the predictability of schedules and costs; (2) Enhance the use of project schedules; (3) Integrate the project management practices; (4) Create an appropriate balance between tools and practice; and, (5) Inform and facilitate management decisions." This proved to be a large effort, since project management is a core vehicle for accomplishing the work of UDOT.

The first step in this project was the administration of a comprehensive survey of participants' understanding of current practices and purpose, and commitment to current practices. A survey, developed previously by a collaboration of project management experts, was distributed to a stratified sampling of employees and contractors across UDOT.

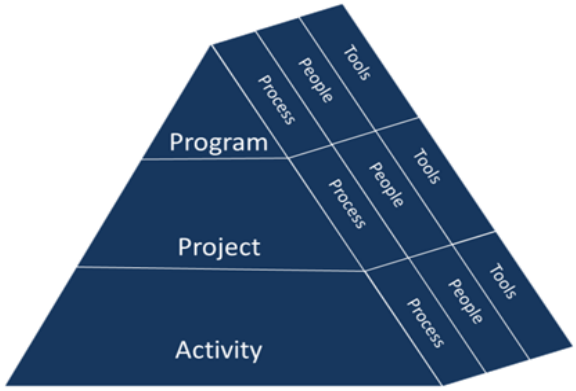


Illustration 1 – Areas of Focus for Project-based organizations

These participants included central and UDOT regional project "actors," including UDOT executives and support organizations, Region leadership, Project and Program Managers, and project participants. The results of the survey established proposed areas of consideration that were presented to regional teams of leadership and project participants in three UDOT Regions for their review, comment, and response. Taking all data points into consideration, a proposal was presented to a central core team composed of UDOT executives, Project Central team members, regional leadership, and project participants across the UDOT organization.

## What was the end result?

***First*** – There is a general desire, even expectation, that project scheduling practices become more standardized across the UDOT organization. This is in the interest that projects be more:

- Predictable – enabling efficient use of funds and human resources
- Consistent – enabling UDOT employees to move more efficiently between projects
- Reliable – enabling project reporting to management to be more than staying off the "Red List."

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**By: Ernest J. Nielsen**
*Brigham Young University*
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*UDOT Research Division*

# PROJECT SCHEDULING RESEARCH (Continued)

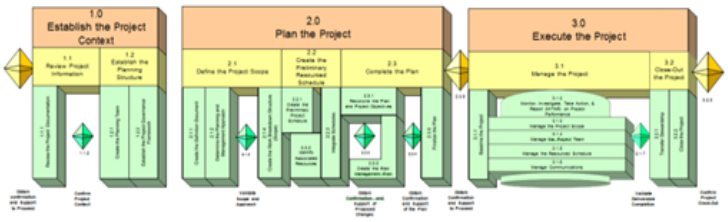


Illustration 2 – Sample Project Management Process Model

***Second*** – The tools used to schedule projects should be separated from, but integrated into, the tools currently used to manage the overall portfolio, including UDOT's Electronic Program Management or ePM.

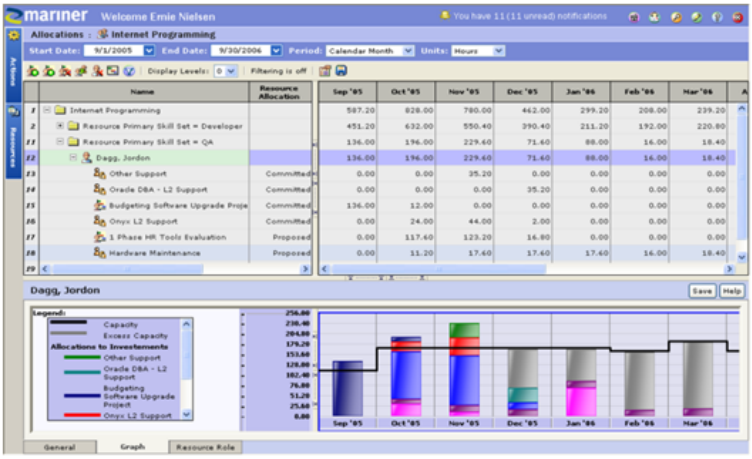


Illustration 3 – Sample Resource Utilization Report

***Third*** – Priority Management needs to be consistently exercised, and priorities should be consistently communicated and enforced throughout the organization. Project status reports to management should enforce established priorities. However, the implementation of priorities is dependent on UDOT leadership understanding the underlying schedule and costs of each project and the status – at any given time – of schedule and cost.

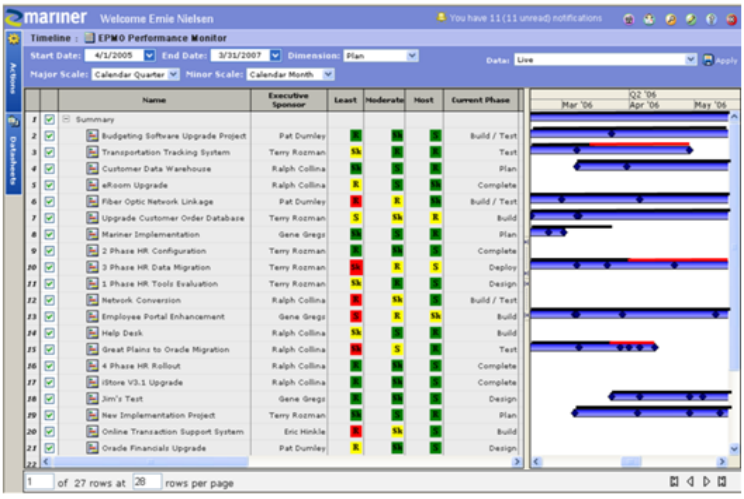


Illustration 4 – Sample Executive Report of Project Status

A comprehensive report of results and recommendations was presented to the core research project team that expands on these three points. This report can be accessed by request to the UDOT Project Central team. Since this report was presented, activities are underway to identify and document a standard project management process. At the same time, efforts are underway to identify and make available a standard project management scheduling tool, outside of ePM, which will integrate gracefully with ePM for portfolio management functionality and enable a higher level of priority management.

This research was conducted by commission from the UDOT Research Division, and under the direction of Daniel Hsaio, Sr. Project Manager, in conjunction and close collaboration with David Adamson and Steven Quinn of the UDOT Project Development Group. Research and recommendations, including survey administration and analysis, were performed by Ernest J. Nielsen, SCPM, PMP of Brigham Young University (BYU).

For more information contact Mr. Nielsen at ernie@byu.edu, or Daniel Hsiao of UDOT Research Division at dhsiao@utah.gov.

By: David Stevens, P.E.
UDOT Research Division

# FIELD EVALUATION OF NEW PRODUCTS: A TEAM EFFORT

Does the Research Division still perform field evaluation of new products? Yes. Our colleague, Barry Sharp, and the Accepted Products List moved from our division to the Central Materials Division in 2010. Since then, the Research Division and the Materials Division have been working together on ongoing and new evaluations. Since new and proprietary products find their way into construction and maintenance activities in various ways, capturing and sharing performance information on some of these installations is a team effort.

The Research Division performs field evaluations of new products when requested by Regions and Central Divisions and as our time and resources allow. Suppliers often participate in the studies by donating products or suggesting evaluation methods. Our objective in performing these evaluations is to provide scientific performance data to UDOT engineers and leaders so they can better decide whether large-scale use of the new product would be beneficial to UDOT and the travelling public. Some of our evaluations have been performed to comply with the FHWA Experimental Features Program.

Figure 1: Deer Deter Device

Information on our evaluations is available via our division website under “Active Research Evaluations”.

One example is on US-191 near Monticello, where we are evaluating the effectiveness of JAFA Technologies’ DeerDeter devices in reducing the number of deer-vehicle collisions. Results over the first year are inconclusive. Review of deer carcass counts and video footage continues.

Figure 2: DuroMaxx Pipes

On Manhead Road in Rich County, we are evaluating deflections of 24-in. culverts using Contech’s DuroMaxx pipe and ADS corrugated HDPE pipe. The DuroMaxx pipe has experienced about half as much deflection as the ADS pipe over the first year at this site.

For more information on our research evaluations, contact David Stevens, davidstevens@utah.gov

Additional helpful sources on new product performance include UDOT engineers and maintenance supervisors, Central Maintenance Division’s Methods Engineering Studies, UDOT’s Accepted Products List, the UDOT Blog, other state DOTs, manufacturers and suppliers, and AASHTO’s Product Evaluation List (APEL) and National Transportation Product Evaluation Program (NTPEP).

By: Catherine Higgins
UDOT Communication Specialist

# 2011 NATIONAL ROADWAY SAFETY AWARD WINNER

The Federal Highway Administration and the Roadway Safety Foundation has recognized UDOT as a winner of the 2011 National Roadway Safety Award for using a moveable barrier on the 3500 South reconstruction project. The annual award program honors “high achievers in the field of roadway safety” for using and documenting safety best-practices.

Initially, the project maintenance of traffic plan called for two travel lanes in each direction. Work zone safety and work progression issues prompted then UDOT Region Two Director Randy Park and the contractor, Granite Construction, to consider using moveable barrier. Adding the movable barrier meant the construction zone could be expanded by an entire lane width. Once the barrier system was put into operation, workers were provided additional separation from traffic and the construction schedule was accelerated.

Figure 1: Barrier being moved on the 3500 South project

Researcher Douglas Anderson of T.Y. Lin International, used UDOT’s Traffic and Safety database to find crash information specific to the corridor. Prior to reconstruction, between 250 to 260 crashes occurred per year. Forty to 50 of these crashes resulted in an injury to the driver or a passenger. About 80 to 90 left-turn crashes were reported in the corridor per year. Left-turn crashes are more likely to result in injuries than sideswipe or rear-end crashes, which generally lead to property damage only.

The barrier improved safety by eliminating left turns, except at major intersections, resulting in fewer crashes. Data shows that about 20 to 25 left-turn crashes were eliminated during the time the moveable barrier was in operation. A conservative estimate shows that using the moveable barrier saved road users between $1.7 to 2.4 million by reducing crashes during construction.

Figure 2: Moveable Barrier on 3500 South.

“The movable barrier allowed the contractor to strike a balance between traffic and construction needs,” states Anderson’s final research report to UDOT. Moveable barrier can be “very effective when used on a surface street,” explains Anderson, when high traffic volume, many turning movements and a directional traffic split are characteristics of the roadway. UDOT’s pioneering use of the innovative technology on an urban travel corridor will help UDOT and other departments of transportation employ the effective safety and construction mobility strategy on projects with similar characteristics.

For more information contact Catherine Higgins at CHiggins@utah.gov.

By: Robert Hull, P.E.
UDOT Engineer for Traffic and Safety

# SAFE DRIVING DURING THE WINTER SEASON

Utah is known for having the "greatest snow on earth," but sometimes as a driver, that snow doesn't seem so great. As we enter the winter months and prepare for snowstorms and other inclement weather, it's important we're all primed to be as safe as possible while driving. UDOT is doing its part to keep roads plowed with its fleet of snowplow trucks and is getting ahead of storms—literally—with new technology to better manage snow maintenance.


Figure 1: UDOT Traffic Operations Center

Before you hit the roads this winter, keep in mind these important safe driving tips:

- Allow extra time to reach your destination during inclement weather.
- Leave extra room between your vehicle and the vehicle in front of you.
- Give snowplows plenty of room, and don't pass them until it is safe.
- Slow down. A good mantra is, "On ice and snow, take it slow."
- Always, always wear your seatbelt.
- Give the road your full attention. Distractions such as cell phones and stereos should be turned off or put out of the driver's way so he or she can focus on the road.

Figure 2: Snow Plow in Action

Additionally, take advantage of UDOT's Commuter-Link website to plan your trip before you go. View current road conditions and crashes, as well as information on weather impacts, such as closures to mountain roads. If you have an iPhone or Droid-based phone, try out the new app too.

Use caution when traveling on or around holidays. While you may be fully alert and focused on driving, other drivers on road may be driving drowsy or impaired. Remember, alcohol is not the only thing that can impair your driving. Illegal drugs, prescription drugs, over-the-counter medicines and lack of sleep can impair your ability to drive safely.

Let's all work together to make this a Zero Fatalities winter season.

For more information contact Robert Hull, rhull@utah.gov or go to UDOT Commuter Link, http://commuterlink.utah.gov/wintertips.aspx